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Hamilton's Water Elevator.

PATENTED FEB. 2ND, 1870.

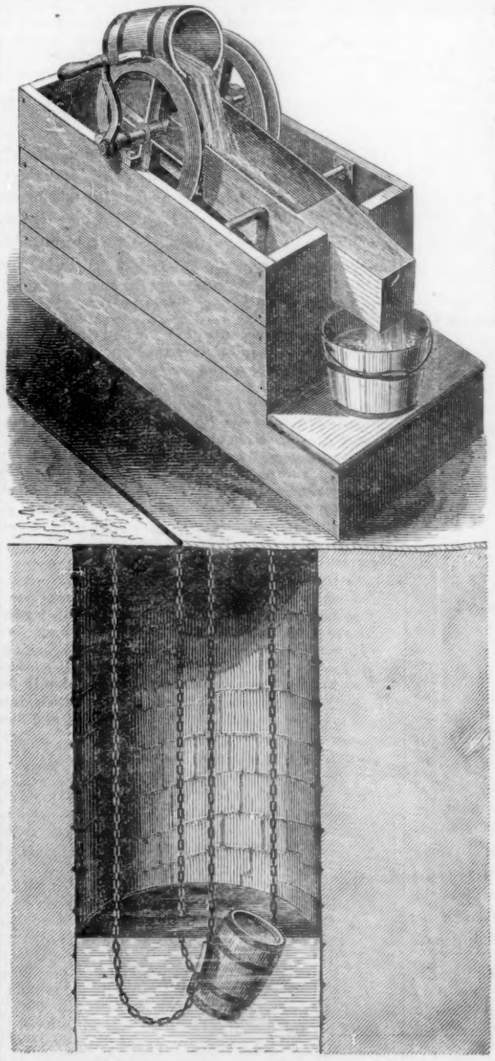
THE "OLD OAKEN BUCKET" RETAINED.

Varied indeed, has been the devices used in all parts of the world, for raising water. Especially to perform this work with the greatest convenience, and with the least expenditure of power, has been the study of a few. Numerous contrivances have been invented, some executing the labor indifferently, some well, but none perfectly. That perfection is much nearer attained in the Elevator herewith illustrated, than in any other, cannot for a moment be questioned by those who will examine its construction.

It probably eliminates the elements of friction to as great an extent as it can be practically done, and therefore applies a maximum proportion of the power to the useful work to be accomplished. The engraving gives an excellent idea of the device. Two grooved pulleys keyed to a shaft, carry each an endless chain, to which, ordinary well buckets are attached in the manner shown. When the shaft is rotated in the proper direction, the buckets successively descend and fill and are drawn to the top; when in passing over the center of the elevating shaft, they empty their contents into the spout. The spout is not fixed, but pivoted in such a manner that it tips to allow the buckets to pass on their descent, for a further supply; and it is also so balanced, that as soon as the bucket has passed, it falls immediately into its normal position. More water can be elevated by a given power, through a given distance, in a given time, by this apparatus, than by the use of any pump, and the number of buckets may of course be multiplied when it is desired to apply steam, or other power greater than can be applied to an ordinary hand machine.

It works in open well, and the water being briskly agitated at each drawing, keeps it thoroughly ærated. Frost or ice does not interfere with its working in the least, as has been fully demonstrated by a winter test. A child can easily operate one of these machines, in any depth of well. Simple, beyond all possibility of making it more so, it cannot be otherwise than durable.

All the time and labor of touching and emptying the buckets by hand being wholly avoided, it greatly facilitates rapidity and ease of operation. When it is understood, that from a well thirty feet deep, with ordinary working *only*, it will easily draw and empty a bucket of water every ten seconds, and fill a barrel in two minutes, nothing more need be added, as to its capacity or power. Inasmuch as it is an apparatus of such decided efficiency and utility, it must necessarily meet a want long felt, and very inadequately supplied.



HAMILTON'S WATER ELEVATOR.

Wisconsin is retained for manufacturing purposes. All other territory is for sale, by States or counties, at advantageous rates.

Parties in search of a "good thing," out of which to make money, need look no farther. It will bear the strictest investigation.

For terms, etc., address the patentee, W. G HAMILTON, Milton, Rock County, Wisconsin.

The Future Supply of Bituminous to the Eastern Markets.

A brief glance at any geological map of the coal regions of Pennsylvania, which cover nearly one-third of the entire area of the State, will be sufficient to convince any one of the vast future importance of our bituminous coal-fields and the magnitude of their boundless resources; but only when compared with the insignificant areas of our anthracite coal-fields, can we appreciate the value of these immense deposits of the most available of fuels.

We possess, says the *Miners' Journal*, considerably less than 509 square miles of anthracite coal formation, and even this limited area has been ruinously encroached on and curtailed by wasteful and improvident mining. Yet those little basins now produce over 15,000,000 tuns of coal annually, or more than two-thirds of the entire coal production of the State.

We may live to see the time when the coal-fields of the State shall produce 50,000,000 tuns annually, since the yearly increase may reasonably be estimated at 2,500,000. Of course this cannot come from the anthracite mines. Our bituminous coal-fields must furnish the largest portion of the annual increase of the coal trade. Anthracite will, moreover, become too scarce, expensive, and valuable for use, when the bituminous will answer the same, or even a better purpose. The royalty on anthracite is, and will be, a large item of its economy, while the cost of mining is, and must be, greatly in excess of the comparative cost in mining bituminous coal. The relative distances from markets, or places of consumption, are in favor of the anthracites in the East, while in the North, Northwest and West, the distances are in favor of the bituminous: but generally the advantage will, in future, be more and more in favor of the latter and against the former, except in favored localities.

With 16,000 square miles of bituminous coal-fields, and less than 500 of anthracite, we must draw largely on the one to save the other in the future. Providentially, we find in bituminous coal the elements needed by science, pre-eminently, for the advancement of the industrial arts of the age.

A pure and rich bituminous fuel is adaptable to all the wants of society for the production of light, heat, and force. It may, or can take the place of anthracite in almost, if not every case, where fuel is required, but anthracite cannot so generally take the place of bituminous coal.

All coals undergo destructive distillation in their combustion, but anthracite, being mainly solid carbon, will only yield its gas, or ignite and burn under a high temperature. But bituminous coal is read ly converted into gas, iguites easily, and burns under a comparatively low temperature, and gas, however produced, will yield greater results in heat than can be obtained from any crude mineral fuel; while the gas is clean and pure, which can scarcely be said of our best coals in their raw state.

In the Siemen's and other similar processess, for the production of cheap gas as a fuel, from ordinary bituminous coal, and its application to the manufacturing arts, we must recognize a scientific improvement of great practical value, adaptable to an almost unlimited extent, and available, not only where intense heat and a pure fuel is required, but also in nearly all cases where coal is scarce and dear, and economy is a consideration.

We find in the statistics of the coal trade for the past year, that the production and consumption of bituminous coal is increasing in a greater ratio than the anthracite. This must continue in the future, until the bituminous column, which a few years ago was insignificant in amount, will lead the coal trade in Pennsylvania. It is now used in our rolling mills and forges, even in the midst of the anthracite mines. This seems like "carrying coals to Newcastle," but is nevertheless a fact; while for the production of illuminating gas, a rich bituminous is the only coal made use of.

Anthracite is a monopoly. It is limited and invaluable for certain important purposes, for use in the blast furnace, for dometic uses generally, and many other cases, where bituminous coal cannot come into competition in the Eastern markets; but the tendency of innovation is against the latter and in favor of the former. Bituminous coal may substitute anthracite in many cases, but anthracite will rarely replace bituminous it future.—*Scientific American.*

Bailey's Patent Pyrometer.

For the estimation of high degrees of temperature which are beyond the range of the indications of ordinary thermometers, instruments termed *pyrometers* are required. Of these the best known is Daniell's Register Pyrometer, which has been employed in many important researches connected with metallurgy. The indications of this instrument depend on the difference in the amount of expansion between a rod of platinum and a bar of black lead ware. Only those who are accustomed to work with instruments of precision can manage this pyrometer, and consequently its use is unknown in the arts. Mr. Bailey, of the Albion Works, Salford, England, knowing that a strong and handy heat measurer has long been a desideratum, has devoted much attention during the last twelve years to researches leading to the production of such an instrument, and we are glad to say that the result of his labors has been most satisfactory. He is now manufacturing pyrometers adapted for various purposes, under patents in England, France, and America. The most novel form of his invention is the Laboratory Pyrometer, which serves to indicate temperatures up to 800° Fah. This instrument consists of a tube fifteen inches long, surmounted by a dial two and a half inches in diameter, and is a reduced copy of the larger pyrometer, which is now extensively used for indicating the temperature of bakers' ovens gas retorts, etc.

It is adapted for dipping into boiling oil, tar, paraffin, or other hot liquids, in open vessels or stills, and for a variety of purposes in the laboratory. Being constructed of metal it is not liable to break, and on this account can be used with advantage for what may be called thermometrical purposes, that is to say, for indicating temperatures below the boiling point of mercury. The principle of Mr. Bailey's pyrometer is the difference in expansion between two different metals, or between metal and porcelain. The temperature is plainly shown by the index of the dial. One important point connected with this pyrometer is the fact that it is adjustable, and can be set to the temperature of the air before it is used.

Chemical Repertory.--No. 33.

JULY 2, 1870.

Editor—HENRY WURTZ.

Editorial.

PICRIC ACID GUNPOWDERS.

In the third number of this Repertory, of date December 2, 1868, a condensed, but very complete account was given of the properties of this class of explosives, and of the prospects held out with regard to them, as well as the disadvantages that must be guarded against. It may be well to say that the proposition to use these explosive compounds as gunpowder is by no means the *novelty* that it is implied to be in the numerous items circulating throughout the journal; being nearly as old as the discovery of picric acid itself.

We append a few sentences from a recent notice in the *Scientific Journal:*

"Among the many practical applications of phenic or carbolic acid, not the least important is its use in the preparation of picric acid, a substance which, in combination with potash and other bases, promises to be of great value to the arts. * * * * Picrate of potash has lately been the subject of extended experiment on the part of an eminent French chemist.

"In conclusion, we may state that the picrate powder is the subject of extensive and secret experiment with the French Government, which will probably use it before long as a substitute for the old-fashioned black gunpowder, in its military and naval services."

THE CHEMICAL CORROSION OF IRON AND STEEL.

[In the first number of the *Manufacturer and Builder*, was an article by the present writer, entitled "Chemical Engineering," which was copied into this Journal (Issue of March 2, 1869, page 262). The importance of the subject is at this day so eminent, that, to introduce the following excerpts from a recent article in *Engineering*, I shall quote a paragraph or two from the article above referred to.—H. W.]

"Since the experiments of Wade and Rodman, it has been obvious to chemists that the bursting of cannon is most frequently due to the corrosion, both superficially and in its inmost substance, even to the extent of a complete honeycombing (especially in the neighborhood of the vent) of the metal; by the injection into its pores of the vapors of sulphur and sulphide of potassium.

"Chemists have long known that pure distilled water will dissolve ferrous hydrate, and in the presence of free oxygen will quickly take up metallic iron into this form of solution. Hence, in a steam boiler such portions of the internal surfaces as are subject to the condensation upon them of distilled water from the steam, in an atmosphere which always contains free oxygen that had been dissolved in the water, and frequently under heat and pressure, must be both corroded superficially and disintegrated internally. In this we have the cause of many of our most fearful disasters.

"How many lives have been lost by the breaking of axles, springs, rails, etc., which might have been saved, had we known how to protect these completely from the corroding action of the oxygen of the air, introduced in aqueous solution into their pores and flaws, none can tell."

On this subject, *Engineering* tells us:

"It has been generally admitted that the action of diluted acids, and of sea water, is more rapid upon steel than upon wrought iron; but a series of experiments made by Mr. Henry Bessemer some years ago, showed that there was an important point in favor of steel, viz., the uniform action of the chemicals upon the whole exposed surface of the steel plate, as compared with the irregular local corrosion concentrated upon certain places of the iron plate. Mr. Bessemer immersed pieces of steel plates and of iron plates in vessels which were filled with diluted acids, and with solutions of different salts. From time to time the plates were removed and examined. The action of the chemicals upon the iron and steel was strikingly different. The steel plate showed an uniform, close-grained texture all over its surface, and under the microscope the steel surface appeared of a homogeneous, crystalline structure. In the case of the iron plate, on the other hand, the chemical action had made more rapid progress at all the minute fissures and openings which represent the welds or the interposed layers of oxides or slags existing between the individual crystals of the wrought iron; and the appearance even to the naked eye showed that peculiar irregularity of surface which is frequently produced upon iron in the process of etching or "damascening." The microscope still further disclosed that the wrought-iron surface was furrowed to a greater or less depth in certain places, upon which the chemical action seemed to have concentrated its effect, and which therefore formed points of weakness, the existence of which in a plate would be far more dangerous than the corrosion of steel, which spreads equally over the whole surface. * * Some very interesting experiments have been recently carried out in France at the works of the Terrenoire Company near St. Etienne. * * * The samples were immersed in sea water, and the effect of the chemical action was put to an immediate quantitative test by means of a galvanometer. * * The amount of electric force which was measurable by the galvanometer was in direct proportion to the quantity of chemical action which took place between the sea-water and the plate, and the indication of the galvanometer gave therefore the exact proportionate amount of corrosive effect produced by the sea-water upon each of the plates. These experiments have confirmed the fact that the corrosion of steel containing more than one third per cent. of carbon is more intense than that of wrought-iron, but the corrosion of the softest kinds of steel containing from one-third per cent of carbon downward is *less* than that of wrought-iron. In fact the amount of corrosion of different kinds of steel seems to follow the exact proportion of the percentage of carbon contained in the metal.

"The evidence of these galvanometric tests has been still further corroborated by keeping the different plates immersed in sea-water for several months, and ascertaining the loss of weight of the plates regularly every week.

"The experiments show in a very conclusive manner that soft steel plates, such as are usually—and ought to be always—employed in ship-building, are *less* liable to suffer from the corrosive action of the sea-water than iron plates. The advantage of the steel plates previously pointed out by Mr. Bessemer is, therefore, still further enhanced by this newly discovered superior resistance to corrosion, which is a property of the softest kinds of steel."

American Chemical News.

THE COAL-FIELDS OF THE PACIFIC COAST.

An important paper on this subject was read recently to the *Edinburgh Geological Society*, by Mr. Robert Brown, from which we condense. The coals of California, extending up through Oregon and Washington Territory, and across the Rocky Mountains, over an immense area, are, as is well known, Tertiary, of the Miocene Epoch. Mr. Brown says:

"The coal is of a very uniform character, burning freely, but leaving behind much slag and ash; and in many cases, though giving out a strong heat, unsuitable for domestic purposes, on account of its sulphurous character.

"Some of the large lumps contain veins of sandstone, varying from ¼ to 1½ inches, and to this possibly may be attributed the great amount of "clinker" which it forms on the furnace bars. The coal itself is hard, giving a brown lignite-like appearance on being scratched, shining equal to the appearance of anthracite, and breaking in small cubical fragments.

"Towards the north, it is only at Bellingham Bay, situated a few miles south of the British boundary line (latitude 49 deg. north) that we find the coal of sufficient thickness and proximity to the sea to render it of sufficient importance to be mined. Here a company has been at work for a number of years, and export a considerable amount of coal to the San Francisco market. It is of the same quality as the other tertiary coals of the coast, and is generally mixed with a better class of coals before being used. The mines are very full of fire-damp, while the various mines of Cretaceous age are entirely free from this.

"The whole coast of Vancouvers Island, on the east coast, north of Chemainos, and round to Koskeemo Sound, on the westward, and for some distance into the interior, is bounded by a belt of carboniferous strata, composed of sandstones, shales, and coarse gravel-stone conglomerates, interstratified with which are beds of coal of much superior character to any hitherto described. These beds, from the fossils they contain, appear to be Cretaceous. Everywhere the strata named form a characteristic accompaniment of the coal, especially the coarse conglomerate just named; and nearly everywhere it is underlaid by one or more seams of coal. Hitherto we have only found it cropping out at some points of the circuit named, though it may reasonably be supposed yet to be found on the opposite shores of British Columbia. The walls of the deep fiords indenting this part of the coast everywhere are, however, in most cases composed of trap and other igneous rocks, and whatever sedimentary rocks may at one time have reposed on their flanks have now been washed off by the action of denudation.

"The Nanaimo coal is bright, tolerably hard, and not unlike some of the best qualities of English or

Welsh coal in appearance. It burns freely, with a good heat, bnt produces a great amount of ash. It is universally used by all Her Majesty's ships on the coast, and by all of the colonial and other steamers plying on the coast. It is highly valued as fuel for domestic purposes, both in Victoria, San Francisco, and other towns. Gas is manufactured from it at Victoria of good illuminating quality. No fire-damp has hitherto been found in the mine.

"North of Vancouvers Island, at a distance of from twenty to forty miles from land, lie the Queen Charlotte Islands, consisting of a group of three main islands, with a number of lesser islets lying off the shore. Of late years coal has been discovered on these islands of a very superior quality. The coal was apparently of the nature of a true anthracite, with a bright lustre, hard, and giving out an intense heat. Recent efforts have been more satisfactory than the earlier ones, but Mr. Brown thinks that the working of the coal will always be difficult, on account of the numerous faults, dykes, and other disturbances."

CHEMICAL EXCERPTA.

PURIFICATION OF DRINKING WATER.

Several towns on the lower Maas, in Germany, are dependent upon the river water for household use, and it has long been known that strangers unaccustomed to drink the water are at once attacked by diarrhea, and other dangerous symptoms.

Although the water has been subjected to analysis and microscopical examination, the real cause of the trouble has not been reached. On the supposition that the unhealthiness of the water proceeded from the solid matter suspended in it and which did not even disappear after long standing, Dr. Gunning succeeded in entirely disinfecting the water by means of chloride of iron. For every two pints of water there are taken 0.032 grammes of the dry chloride of iron, dissolved in distilled water, the whole is well stirred and suffered to stand 36 hours, at the end of which time a flocculent precipitate will have formed. To insure the neutralization of any hydrochloric acid that may be formed, 0.085 grammes of crystallized soda to two pints of water may be added. This method of purification has been thoroughly tested and is easy of application to any well water containing organic matter.

There are no disinfectants more valuable than iron salts; and in the case of cesspools and sinks about private houses, they ought to be better known and more largely employed. Metallic iron will also prevent water from becoming foul. It is well known that iron rusts in water chiefly at the expense of the free oxygen contained in it. If water be scaled up in a flask after the removal of the free oxygen a polished piece of iron will remain bright for an indefinite length of time. By putting iron filings into a cask of water stored for a long voyage the usual bad smell will be prevented. So, also, the water in a vase with flowers will be less likely to smell badly if a few nails be put in, than otherwise.

It thus appears that iron is one of our cheapest and best agents, both in the form of salts and of metal, for the disinfection or the preservation of water.—*Journal Applied Chemistry.*

OXYGEN GAS BEING INTRODUCED IN THE STREETS OF PARIS

The new Prefect of the Seine has definitely authorized the Tessie du Motay Company to lay their underground communications in the city of Paris, for illuminating with the oxygen gas. The new oxygen works of Pantin will be connected with the boulevards, and, in a few months, all the inhabitants between the new Opera House and the "Passage Jauffray" will be enabled to derive the benefits which are expected to be conferred by this light. Already, oxyhydric lanterns have been placed at the entrance of tie "Bazar European," near the "Passage Jauffray," and they give a light of the purest white and the utmost brilliancy, beside which the gas now generally used pales and appears to have a most singular yellowish color. We congratulate the Prefect of the Seine on having ratified a measure in accordance with the general interests, and which appears to us to be the indispensable corollary of the great improvements undertaken within a few years in Paris.—*Journal Applied Chemistry.*

ON LIQUID OR CONCENTRATED FUEL.

(*Condensed Abstract.*—H. W.)

[Read by Capt. J. H. Selwyn, R. N., before the Institution of Naval Architects. London.]

Capt. Selwyn showed in a former paper that the chemical analysis of the oil used entitled us to expect that its theoretic calorific value—that is, the number of pounds of water, one pound of the oil be used might, theoretically, be expected to evaporate—would be 17.5. He also showed that in a trial at Woolwich in the Oberon boiler, in which economy was the sole object, and quantity was ignored for the time, 16.9 lb. of water were evaporated.

He now says that from the experiments of Bunsen and Tyfe—names which command the highest confidence among chemists of all nations—it appears that red-hot coal "and aqueous vapor mutually decompose each other into hydrogen and carbonic oxide gases, with some carbonic acid, both of which, if sufficient oxygen be present, burn with the production of a white heat, to form water and carbonic acid, and that numerous observations showed, further, that the additional heat evolved more than compensated for the fuel used in producing the vapor."

At a time when 16.1 lb. of water were being evaporated by the use of each 1 lb. of oil, the theoretic calorific value being 17·5, the temperature of the chimney, or that of the escaping gases, was 680 deg. Fah. Now, according to one of Prof. Macquorn Rankine's formulæ, 680 deg. Fah. corresponds, under the conditions, to a loss of 2·7 pounds of water vaporisable. Now, deducting the evaporation actually obtained, namely, 16·1 from 17·5, the theoretic ultimate calorific effect of the oil, we have 1·4, which might possibly be due to the oil; but how shall we account for the other 1·3 of heat in the escaping gases, unless we allow that this is a corroboration of Bunsen and Tyfe's observations, and that, consequently, the water used in jets ought not to be deducted from the total evaporation of water from the constant of 212 deg. feed.

As regards safety, there is no longer the slightest doubt in the minds of those who use this fuel. The oil only differs from ordinary train oil in this particular, for the reason that train oil would float on, but this oil sinks under salt water. It is, therefore, less liable to accidental combustion, and more easily put out, should it ever inflame when substances are put into it that may act as wicks. A white-hot fire brick may be plunged into the oil with the most perfect impunity. If shavings are thrown in and set on fire these form wicks, and the oil burns as train oil would do, but water will instantly extinguish even this; in short he confidently states that all idea of danger may be dismissed, at once and forever, with an oil whose specific gravity is 1·050 and upwards.

He is satisfied that there is an ample supply of material from which the oil can be obtained at a remunerative price; that ship-owners can well afford to give from £2 to £3 a ton for it when they know its use thoroughly; and that it is at this moment cheap to use it at the 30s. per ton of 213 gallons, which is asked for it, seeing that one ton of it—used without stoking, be it remembered—is equal to two tons of coal in evaporative duty, and that that ton only takes 38 cubic feet of space instead of 92 cubic feet, which two tons of coal would occupy.

At Wareham, near Poole, the distillation of shale (forming cliffs along that coast) was once carried on with a result of fifty gallons of crude oil to the ton of shale, or Kimmeridge clay. This distillation was voted a nuisance by the inhabitants, as it was attended by a very disagreeable smell, which was, however, solely due to the fact that the distillers did not then provide means of burning the gases under the stills as they might and ought to have done, with considerably increased economy in the production.

GERMAN CHEMICAL SOCIETY.

A. Vogel, *on the detection of bisulphide of carbon in coal gas.*—This new method consists simply in passing the gas, after all sulphuretted hydrogen has been separated, through a glass bulb containing strips of bright copper. The latter assumes irised tints, and nitric acid boiled with it afterwards, gives a precipitate of sulphate with a barium salt. This, if reliable, is an exceedingly valuable method. It will at once be tested by us. H. W.

B. Badziszewski, *on Straw-Wax.*—This was obtained by the investigator from a straw-paper factory. It is solid; white; greasy to the touch; *insoluble in caustic alkalies, even boiling;* soluble in alcohol especially when hot; soluble in ether and bisulphide of carbon. It crystallizes from alcohol, in pearly brilliant scales, which are greasy; melts at 42° C. (= 108° F.) to a colorless oil which on cooling becomes hard and brittle. Boils without decomposition at 300° C. (= 572° F.), leaving but little residue. Has a strong odor of rotton straw, due probably to impurity. Bromine attacks it, but hot concentrated nitric acid with difficulty. Concentrated warm sulphuric acid dissolves it, from which solution water precipitates it apparently unaltered It has some analogy with the sugar-cane-wax, which fuses, however only at 80° C. (= 180° F.) [This curious class of waxes should receive much further examination. The indifference to alkalies might make this one very valuable. If of value, it should be readily cheaply, and abundantly obtainable from straw by means of bisulphide of carbon. It does not appear that the author has given any analytical results.—H. W.

V. Wartha, *on the freezing of Bisulphide of Carbon.*—The books say that this liquid solidifies but at 90° below zero C. (= — 130° F.); but the author has observed the surprising fact that by directing a very rapid current of dry air over the *pure* bisulphide (purified by means of an amalgam of silver), it is easily frozen. An immersed thermometer sinks rapidly as low as — 18° C. (about zero F.), but the temperature of the mass, when all frozen solid, rises to — 12° C. (= 10°4 Fah.), and remains there during the melting. This is therefore the true point of congelation of CS^2. The solid CS^2 is easily preserved solid for some time, and presents phenomena similar to those of solid carbonic acid. In this state it possesses a peculiar aromatic odor. In a vacuum, the anthor only succeeded in congealing CS^2 after previous admixture of ether. H. W.

Armand Gautier, *On the First Isolation of Chloroform.*—The discovery of Chloroform is attributed to Soubeiban, Leibig, and our American Guthrie, about 1830, but Gautier shows satisfactorily that Serullas had it in his hands in 1824, six years previously, without recognizing its true nature, he having actually obtained Chloroform by the action of perchloride of phosphorus on *iodoform*, which latter body he had then just discovered. Serullas thought the product was iodoform deprived of a portion of its iodine, and called it *protohydriodide of carbon.* Boutlerow afterwards concluded it was *iodide of methylene;* but Gautier now finds that it was nothing more or less than chloroform. —*Societe Chimique de Paris, April* 1870.—H. W.

Pure Nitrogen.—Berthelot recommends for the preparation of pure nitrogen to agitate air in a flask furnished with a safety tube with aqua ammonia and copper turnings. He then pours in, through the safety tube, water which has been previously treated with ammonia and copper turnings, and drives the nitrogen through sulphuric acid to dry it and absorb ammonia, and collects it over quicksilver.—*Soc. Chimique de Paris, Avril,* 1870.—H. W.

G. Bizio, *On Spontaneous Decomposition of Oxalic Acid.*—In *very dilute* solution, six or seven grains to the quart, oxalic acid undergoes a complete decomposition, after a greater or less period (according to the temperature), which may be but a month, in summer. The agency is oxidation by the air; and a somewhat stronger solution undergoes no change.—*Zeitschrift für Chemie.* H. W.

Manufacture of Aniline.—Together with the well-known process of Bechamp, for the reduction of nitrobenzole by means of acetic or muriatic acid and iron, may be classed a method first used by Chalamel, at Puteaux. He made to react upon it a mixture of water, iron, and iron coated previously with copper. The voltaic action set up eliminates hydrogen in the "nascent form," which reduces the nitrobenzole to aniline. —*Bull. Soc. Chimique, Mai,* 1870, *p.* 479.—H. W.

Protection of Lead Water-Pipes.—A paragraph is going the rounds of the scientific journals and the newspapers generally, to the effect that Dr. Schwarz, of Breslau, has found a simple way of protecting lead pipes from the action of water, by forming on their inner surface an insoluble sulphide of lead. This is done by filling the pipes with a warm and concentrated solution of sulphide of potassium or of sodium, which is left in contact with the lead for about fifteen minutes.

This, says the Boston *Journal of Chemistry,* may be a new thing in Breslau; but more than two years ago we suggested a similar process as, on the whole, the best that we knew for the purpose. The directions we gave were as follows: Dissolve one pound of sulphide of potassium in two gallons of water, and let it remain in the pipe twelve hours, or until the inside is thoroughly blackened. The same recipe was given in Rolfe and Gillet's "Hand-book of Chemistry," published in 1868. The use of a warm saturated solution, as Dr. Schwarz directs, would do the work in shorter time, which might be more convenient in some cases.—*Sci. American, June* 11.

[We have an impression that our readers are thoroughly familiar with the method of Dr. Schwarz of Breslau, and that our notice of it (*considerably more than two years ago*) condemning it on chemical grounds, will not be without remembranee.—H. W.]

Gas Wells.

We take the following extraordinary item from the *U. S. Railroad and Mining Register:*

Oil City, May 17, 1870.

The "Burning Well," as it is called, is located in Pine Grove township, Venango county, between main Sandy Creek and the branches of the same. It is about fifteen miles from Oil City, in a southeasterly direction.

This well was drilled in 1866 upon the lands of and by a Philadelphia oil company, to a depth of 850 feet to the third sand rock. After drilling a short distance into this a heavy mud vein was met with, the toools became fastened in the same, and have never been removed. The well was tubed at the time, and testing commenced. In a very short time the force of the gas became so great as to burst the seed bag. The tubing was being drawn when the rope broke and six hundred feet of the same dropped into the well. Operations wore then suspended. A good show of oil was apparent in all the sand rocks. When abandoned the gas came from the well in immense volumes, throwing occasionally a large amount of both water and oil. In 1868, Mr. J. B. Benton obtaining a lease of the burning well and several acres adjoining, went to work to get the well in some shape whereby he could test or control it. Being one of our most practical operators, he soon succeeded in doing this. The tubing was removed, but the tools remain. Upon effecting this he commenced the drilling a new well a short distance from the old one. This was drilled to the depth of nine hundred and sixty feet. It was finished the latter part of the past winter. Had the well been cased, it would doubtless have proved highly productive. So great has been the force of the gas in the new well, that it is only within the past few weeks that they have been enabled to pump it to any advantage. At the time of our visit the well was pumping with excellent show. The burning well has been flowing gas, water and oil for over four years, and its force seems unimpaired. The gas comes from the well at an estimated pressure of fully two hundred pounds to the square inch, could the same be confined to proper dimensions. This would be capable of lifting to the surface 15,000 to 20,000 barrels of oil per day. And no doubt this pressure could be materially increased. The gas from the new well seems to be greater than from the old in both volume and force. Nor is there any apparent diminution on the part of the older well.

The new well is now being pumped, *and the engine is run by the pressure of the gas alone.* The gas is conveyed from the old well to the engine house of the new one, by means of an ordinary two inch iron gas pipe. The attachment is made by the pipe used for the steam. The gas is let on in sufficient quantity, and off goes the engine with a steady motion without fuel, steam, boiler, exhaust-pipe, or attachment of any kind. This may seem marvellous to yourself and readers. Any of them can see the same, and form their own conclusions. Any number of engines can be run by the force of the gas from these wells, and enough fuel be furnished besides for all the wells that can be put down in the neighborhood. I consider the whole affair as one of the most remarkable exhibitions of nature's forces extant, and that wells are worthy the attention of the scientific and curious. The applieation of the gas in this shape also involves a principle that will soon or late work an entire revolution in application of motive power, viz; the dispensing with heat as a requisite; the temperature of the gas as it comes from the wells is extremely cold, chilling the hands. So, strange as it may seem, the engine is run by the pressure of cold air. No difficulty has been experienced in working the engine. The oil in the gas acts as a perfect lubricator. The engine was running at a pressure equal to sixty pounds of steam, and by turning on the gas, could be easily run to its full capacity. Nine hundred feet of tubing was drawn from the well a short time since by this engine, operated as described, and only a single block used, three lengths being drawn at a time.

The country is admirably located for operating, and is just now exciting the interest of operators. Lands and leases are being rapidly taken up, and several new wells have been commenced. The third sand rock of the new well is sixty-three feet in thickness, open or honey combed and consists chiefly of pebble. It is pronounced by experts as the best yet seen. I predict stirring times in the new locality within the next thirty days.

Oxygen Light.—M. Tessie du Motay has succeeded in obtaining a beautiful oxyhydric light by means of oxygen gas and supercarburreted hydrogen, doing entirely away with the lime, magnesia, or zircon pencils, which were the greatest objection to the universal application and public adoption of this new light. The great recommendation of this light is its brilliancy and cheapness. The cost, as we are told, is only two centimes per burner for five hours, or at the rate of three cents per week, for five hours each of the seven nights. In using this new method, M. Tessie du Motay has also avoided the high pressure formerly used, in order to obtain the brilliancy desired, and the two gases now arrive at the burner at a pressure of about one inch of water column. The manufacture of oxygen by the manganate has also enabled M, Tessie du Motay to fulfill large contracts with alcohol bleachers and distillers in Paris and London, who are using the manganates to bleach and deodorize their spirits, to obtain the colorless and odorless Cologne spirits.—*Exchange.*

The Chemical History of a Candle.

BY PROFESSOR FARADAY.

[A course of Six Lectures delivered before the ROYAL INSTITUTION of Great Britain.]

A CANDLE—THE FLAME—ITS SOURCES—STRUCTURE—MOBILITY—BRIGHTNESS.

I purpose thanking you for the honor you do us in coming to see what are our proceedings here, by bringing before you the Chemical History of a Candle. I have done so on a former occasion, and if I had my own will, I should do it almost every year; so abundant is the interest that attaches itself to the subject, so wonderful are the varieties of outlet which it gives into the various departments of philosophy. There is not a law under which any part of this universe is governed, which does not come into play and is touched upon in these phenomena. There is no better, there is no more open door by which you can enter into the study of natural physical philosophy, than by considering the phenomena of a candle. Therefore I believe I shall not disappoint you in choosing this for my subject rather than yan newer form, which could not be better, if it were so good.

And having said so much to you, let me say this also: that though our subject be so great, and our intention that of treating it honestly, philosophically and seriously, yet I mean to pass away from all those here who are seniors. I claim the right of speaking to juveniles as a juvenile myself. I have done it it on former occasions, and, if you please, I shall do it again. And though I know that I stand here with the knowledge of having the words I utter given to the world, yet that shall not deter me from speaking in the same familiar way to those whom I esteem nearest to me on this occasion. You know that though we make no publication of our proceedings—neither I nor the authorities—we give all facilities to those who honor us by supposing what they hear here is worth conveying further—we give them every facility to hear us and write about us, but it is entirely their own act. You have here the original, in whatever shape it appears anywhere else.

And now to my boys and girls.

I must first tell you what candles are made of. Some are very curious things. I have here some bits of timber, branches of trees particularly famous for their burning. And here you see a piece of that very curious substance taken out of some of the bogs of Ireland, called *candle wood*, a hard, strong, excellent wood, evidently fitted for good work as a resister of force, and yet withal burning so well that when it is found they make splinters of it and torches, since it burns like a candle, and gives a very good light indeed. And here in this wood is one is one of the most beautiful illustrations of the general nature of a candle that I can possibly give. The fuel provided, the means of bringing that fuel to the place of chemical action, the regular and gradual supply of air to that place of action—heat and light—all produced by a little piece of wood of this kind, forming, in fact, a natural candle.

But we must here speak of candles as they are in commerce. Here are a couple of candles commonly called "dips." They are made of lengths of cotton cut off, hung up by a loop, dipped into melted tallow, taken out again and cooled, then re dipped, until there is an accumulation of tallow round the cotton. In order that you may have an idea of the various characters of these candles, you see these which I hold in my hand—they are very small and very curious. They are, or were, the candles used by the miners in coal mines. In olden times the miner had to find his own candles, and it was supposed that a small candle would not so soon set fire to the fire-damp in the coal mines as a large one, and for that reason, as well as for economy's sake, he had candles made of this sort, 20, 30, 40, or 60 to the pound. They have been replaced by the steel mill, and then by the Davy lamp, and other safety lamps of various kinds. I have here a candle that was taken out of the *Royal George*, it is said, by Sir George Pasbley. It has been sunk in the sea for many years, subject to the action of salt water. It shows how well candles may be preserved, for though it is cracked about and broken a good deal yet when lighted it goes on burning regularly, and the tallow resumes its natural condition as soon as it is fused.

Mr. Field, of Lambeth, has supplied me abundantly with beautiful illustrations of the candle and its materials; I shall, therefore, now refer to them. And first, there is the suet—the fat or the ox—Russian tallow, I believe, employed in the manufacture of these dips, which Guy Lussac, or some one who entrusted him with his knowledge, converted into that beautiful substance, stearine, which you see lying beside. A candle, you know, is not now a greasy thing like an ordinary tallow candle, but a clean thing, and you may almost scrape off and pulverize the drops which fall from it without soiling anything. This is the process he adopted:—The fat or tallow is first boiled with quicklime, and made into a soap, and then the soap is decomposed by sulphuric acid, which takes away the lime, and leaves the fat rearrranged as stearic acid, whilst a quantity of glycerine is produced at the same time. Glycerine—absolutely a sugar, or a substance similar to sugar—comes out of the tallow in this chemical change. The oil is then pressed out of it; and you see here this series of pressed cakes, showing how beautifully the impurities are carried out by the oily part as the pressure goes on increasing, and at last you have left that substance which is melted and cast into candles as you here see them. The candle I have in my hand is a stearine candle, made of stearine from tallow in the way I have told you. Then here is a sperm candle, which comes from the purified oil of the spermaceti whale. Here also is yellow beeswax and refined beeswax, from which candles are made. Here too, is that curious substance called "paraffine," and some paraffine candles, made of paraffine obtained from the bogs of Ireland. I have here, also, a substance brought from Japan since we have forced an entrance into that out-of the way place—a kind of wax, which a kind friend has sent me, and which forms a new material for the manufacture of candles.

And how are these candles made? I have told you about dips, and I will show you how moulds are made. Let us imagine any of these candles to be made of materials which can be cast. "Cast!" you say. "Why, a candle is a thing that melts, and surely if you can melt you can cast it." Not so. It is wonderful, in the progress of manufacture, and in the consideration of the means best fitted to produce the required result, how things turn up which one would not expect beforehand. Candles cannot always be cast. A wax candle can never be cast. It is made by a particular process which I can illustrate in a minute or two, but I must not spend much time on it. Wax is a thing which, burning so well and melting so easily in a candle, can not be cast. Here is a frame with a number of moulds fastened in it. The first thing to be done is to put a wick through them. Here is one—a plaited wick, which does not require snuffing—supported by a little wire. It goes to the bottom, where it is pegged in, the little peg holding the cotton tight and stopping the aperture, so that nothing fluid shall run out. At the upper part there is a little bar placed across, which stretches the cotton and holds it in the mould. The tallow is then melted, and the moulds are filled. After a certain time, when the moulds are cool, the excess of tallow is poured off at one corner, and then cleaned off altogether, and the ends of the wick cut away. The candles alone then remain in the mould, and you have only to upset them, as I am doing, when out they tumble, for the candles are made in the form of cones, being narrower at the top than at the bottom, so that what with their form and and their own shrinking, they only need a little shaking and out they fall. In the same way are made these candles of stearine and paraffine. It is a curious thing to see how wax candles are made. A lot of cottons are hung upon frames, as you see here, and covered with metal tags at the ends, to keep the wax from covering the cotton in those places. These are carried to a heater where the wax is melted. As you see, the frames can turn round, and as they turn, a man takes a vessel of wax and pours it first down one, and then the next, and the next, and so on. When he has gone once around it, if it is sufficiently cool, he gives the first a second coat, and so on until they are all of the required thickness. When they have been thus clothed, or fed, or made up to that thickness, they are taken off and placed elsewhere. I have here, by the kindness of Mr. Field, several specimens of these candles. Here is one only half finished. They are taken down and well rolled upon a fine stone slab, and the conical top is moulded by properly shaped tubes, and the bottoms cut off and trimmed. This is done so beautifully that they can make candles in this way weighing exactly four or six to the pound, or any number you please.

We must not, however, take up more time about the mere manufacture, but go a little further into the matter. I have not yet referred you to luxuries in candles (for there is such a thing as luxury in candles). See how beautifully these are colored; you see here mauve, Magenta, and all the chemical colors recently introduced, applied to candles. You observe, also, different forms employed. Here is a fluted pillar most beautifully shaped; and I have also here some candles sent me by Mr. Pearsall, which are ornamented with designs upon them, so that, as they burn, you have, as it were, a glowing sun above, and a bouquet of flowers beneath. All, however, that is fine and beautiful, is not useful. These fluted candles, pretty as they are, are bad candles; they are bad because of their external shape. Nevertheless, I show you these specimens sent to me from kind friends on all sides, that you may see what is done and what may be done in this or that direction, though, as I have said, when we come to these refinements we are obliged to sacrifice a little in utility.

Now as to the light of the candle. We will light up one or two, and set them at work in the performance

of their proper functions. You observe a candle is a very different thing from a lamp. With a lamp you take a little oil, fill your vessel, put in a little moss or some cotton prepared by artificial means, and then light the top of the wick. When the flame runs down the cotton to the oil, it gets extinguished, but it goes on burning in the part above. Now, I have no doubt, you may ask, how is it that the oil, which will not burn of itself, gets up to the top of the cotton where it will burn? We shall presently examine that; but there is a much more wonderful thing about the burning of a candle than this. You have here a solid substance with no vessel to contain it; and how is it that this substance can get up to the place where the flame is? How is it that this solid gets there, it not being a fluid? or, when it is made a fluid, then how is it that it keeps together? This is a wonderful thing about a candle.

We have here a good deal of wind, which will help us in some of our illustrations, but teaze us in others; for the sake, therefore, of a little regularity, and to simplify the matter, I shall make a quiet flame, for who can study a subject when there are difficulties in the way not belonging to it. Here is a clever invention belonging to some costermonger or street stander in the market-place for the shading of their candles on Saturday nights, when they are selling their greens, or potatoes, or fish. I have very often admired it. They put a lamp-glass round the candle, supported on a kind of gallery, which clasps it, and it can be slipped up and down as required. By the use of the lamp-glass, employed in the same way, you have a steady flame, which you can look at and carefully examine, as I hope you will do, at home.

You see then, in the first instance, that a beautiful cup is formed. As the air comes to the candle, it moves upward by the force of the current which the heat of the candle produces, and it so cools all the sides of the wax, tallow or fuel as keep the edge much cooler than the part within; the part within melts by the flame that runs down the wick as far as it can go before it is extinguished, but the part on the outside does not melt. If I made a current in one direction, my cup would be lopsided, and fluid would consequently run over—for the same force of gravity which holds worlds together holds this fluid in a horizontal position, and if the cup be not horizontal, of course the fluid will run away in guttering. You see, therefore, that the cup is formed by this, fine uniform, regular ascending current of air upon all sides which keeps the exterior of the candle cool. No fuel would do for a candle, which has not the property of giving this cup, except such fuel as the Irish bog wood, where the thing is like a sponge and holds its own fuel. You see now why you would have had such a bad result if you were to burn these beautiful candles that I have shown you, which are irregular, intermittent in their shape, and cannot, therefore, have that nicely-formed edge to the cup which is the great beauty of a candle. I hope you will now see that the perfection of a process, that is, its utility, is the better point of beauty about it. It is not the best looking thing, but the best acting thing which is the most advantageous to us. This good looking candle is a bad burning one. There will be a guttering round about it because of the irregularity of the stream of air and the badness of the cup which is formed thereby. You may see some pretty cases (and I expect you to think of these things) of the action of the ascending current when you have a little gutter run down the side of the candle, making it thicker there than it is elsewhere. As the candle goes on burning, that keeps its place and forms a little pillar sticking up by the side, because as it rises higher above the rest of the wax or fuel, the air gets better round it, it is more cooled and better resists the action of the heat at a little distance. Now, the greatest mistakes and faults with regard to candles, as with regard to other points, often bring them with instruction which we would not receive if they had not occurred. We come here to be philosophers, and I hope you will always remember that whenever a result happens, especially if it is new, you should say, "What is the cause? Why does that occur?" and you will, in the course of time, find it out.

Then there is another point about these candles which will answer a question—that is, as to the way in which this fluid gets out of the cup, up the wick and into the place of combustion. You know that the flames on these wicks burning in candles made of bees-wax, or stearine, or spermaceti, do not run down to the wax or other matter, and melt it all away, but keep to their own right place. They are fenced off from the fluid below, and do no encroach on the cup at the sides. I cannot imagine a more beautiful and compact thing than the condition of adjustment under which a candle makes one part subserve to the other to the very end of action. A combustible thing like that, burning away gradually, never being intruded upon by the flame, is a very beautiful sight; especially when you come to learn what a vigorous thing flame is—what power it has of destroying the wax itself when it gets hold of it, and destroying its proper form even before it gets hold of it, if it come too near.

[To be continued.]

R. M. Potter's Improved Union Coupling.

PATENTED MARCH 8, 1870.

This improvement consists of an "adjustable cap" for gas and water pipe connections. The intelligent reader will see its advantages by a glance at the accompanying engravings and description herewith.

The screw cap, *A*, is split or divided, and provided with lugs *a*, *b*, through one of which an adjusting screw, *c*, is fitted and made to screw into the other, so that said cap may be more or less opened and closed to adapt it to any different sizes or diameters of the male thread *B*; for although it is usual to cut the screw-

Fig. 1

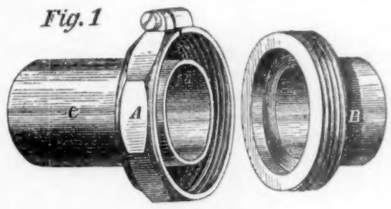
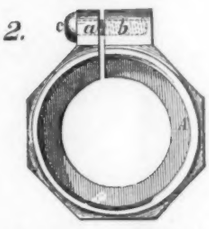


Fig. 2.



threads on such couplings by a standard gauge, yet differences in diameters or sizes will occur, owing, not unfrequently, to the fact that different parts of the coupling are made by different makers, and from other causes. This difficulty, however, to an easy and proper fit, is remedied by the divided construction of the screw-cap *A* and adjusting screw *c* combined; and by the slackening or tightening the adjusting screw. Increased facility also is afforded for screwing on or off the cap, and of tightening or holding it when on.

This invention is especially applicable to gas meters which will commend it to gas companies, inasmuch as it remarkably facilitates the troublesome process of changing meters, and makes a perfect connection with certainty and despatch.. This Cap is applicable to gas, steam, or water connections.

For further information address or apply to R. M. POTTER & Co., Proprietors, Jersey City Gas Meter Works, 14 Morris street, Jersey City, N. J.

Aero-Steam Engines.

The advocate, says, the *Engineering*, of what is known here as the Warsop system claim that the application of that system to a boiler and engine prevents the formation of incrustation, does away with priming, and effects a considerable economy of fuel. Now we have no wish to deny that under certain circumstances results have been obtained which appear to warrant the above claims, *in those* particular *cases*; but what we object to is, that these results should be made the foundation of totally fallacious arguments on the value of the "aero steam" system of working. It may be that the injection of heated air into a boiler is under certain circumstances, a good way of promoting the circulation in that boiler and thus preventing the evils by which a want of proper circulation is attended; but it by no means follows from this that the injection of air is the best way of producing circulation under all circumstances. On the contrary, until we have clear evidence afforded to us that the injection of air so far improves the economic evaporation of, not a bad, but a thoroughly good boiler, as to more than repay the cost of forcing in that air, we shall regard the system merely as a means of counteracting faults of construction which should not have any existence. As with the boiler so with the engines. Non condensing engines having unjacketed cylinders, supplied with steam at 40 lbs. per square inch, and worked with but little expansion, have in certain cases showed more economical results when worked with a mixture of steam alone in the ordinary way. But we submit that such engines—although we regret to say that large numbers of them exist—are not fair examples of steam machinery, and that the credit to be derived from heating them in economy is but very small. Given an engine consuming say 8 lb or 10 lb of coal per indicated horse power per hour, and the difficulty of making such alterations as will produce a more economical result is not great.

If the aero-steam engine is to take a high position in the future, it must do far more than this; it must be more economical both as regards fuel and maintenance than steam engines of thoroughly good construction, such as are turned out by our leading makers; and at present we have but small hope that any such proof will be forthcoming. In making this assertion, we have no wish to discourage Mr. Warsop, Mr. Parker, or others, who, like them, are experimenting on the use of steam and air in combination; but what we desire to point out is, that they would save themselves much useless present labor and expense, and future disappointment, if, instead of contenting themselves with heating indifferent steam engines, they would ascertain carefully and without prejudice, just what their respective systems can or can not effect under the best conditions under which thy can be applied. Engineers well know that for a certain sum of money a steam engine can be constructed to develope a certain power with a certain consumption of fuel. Let it be proved that by the adoption of the "aero steam" system there can be constructed for the same sum an engine developing a greater power with the same consumption of fuel, and without any increased cost of maintenance, and the value of mixed steam and air engines will be established.

Coal Mines on Fire.

There are many instances of vast masses of coal which have ignited and have been burning for years When once well lighted and all communication with the external air is not entirely cut off (and some imperceptible fissures are quite sufficient to prevent this), then the devouring element pursues its course without interruption. It partially burns the coal and calcines the sandstones and adjacent schists, changing their colors to a sort of red, and altering their composition. At Brulé, near Saint-Etienne, there is a coal mine which has been on fire from time immemorial. The soil at the surface is baked and barren; hot vapors escape from it; sulphur, alum, sal-ammoniac and various natural products are deposited on it; it might be supposed to be a portion of the accursed cities formerly consumed by the fires of heaven and earth.

Other burning coal mines are cited in France; for example, those of Decazeville, in Aveyron, and of Commentry, in the department of Allier. The inhabitants have even, for a long time, kept up these fires for the sake of working the aluminous salts which are given off from the coal and are deposited on the surface of the soil as a whitish efflorescence.

In the carboniferous basins of the Saarbruck and Silesia, there are likewise coal mines which have been on fire for a long time. In Belgium, between Namur and Charleroi, at a place called Falizolle, the fire has been alight for many years. The inhabitants formerly were in the habit of working the coal on their own account. Now it frequently happened that two parties came in contact, causing endless disputes and sometimes sanguinary fights. A favorite way of keeping rivals or competitors at a distance was to throw pieces of old leather on a burning brazier, causing an insupportable stench. One day the fire extended also to the coal, since which time it has never ceased burning. The fire, which burns underground, is seen through fissures in the surface. Sulphur deposits itself round these vents and acid gases are evolved.

In England, especially in Staffordshire, the ignition of the coal has produced surprising effects of alteration in the measures containing coal. The sandstones have become vitrified, baked and dilated by the fire, the banks of plastic clay hardened and changed into porcelain.

In the environs of Dudley there was formerly a coal mine on fire. The snow melted in the gardens as soon as it touched the ground. They gathered three crops a year; even tropical plants were cultivated; and, as in the Isle of Calypso, an eternal spring prevailed. In another Staffordshire colliery, the firing of which dates many years back, and which is called by the inhabitants "Burning Hill," it was noticed, as at Dudley, that the snow melted on reaching the ground, and that the grass in the meadows was always green. The people of the country conceived the idea of establishing a school of horticulture on the spot. They imported colonial plants at a heavy expense, and cultivated them in this kind of open-air conservatory. One fine day the fire went out, the soil gradually resumed its usual temperature, the tropical plants died and the school of horticulture was under the necessity of transferring their gardens elsewhere.—*Underground Life.*

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—EDS.]

Decision of the Ohio Legislature in Regard to Gas Companies.

TIFFIN, OHIO, June 14, 1870.

Messrs. Editors: The Ohio Legislature has been three years tinkering with the laws in relation to gas companies; and you published at the time the controversy pending between the City Council and the Cincinnati Gas Company, but so far as I have seen, have never published the result. That result is very important to the gas men of Ohio, and it will be well if you draw attention to it. The decision was by a full bench, December Term, 1868, Supreme Court; published in "State Reports." It was therein set forth that no city had the power to make any agreement granting *exclusive* privileges to any gas company, and that those having a special charter (Cincinnati Gas Co.) by the law of March 3rd, 1853, had their charter abrogated, and came under that law.

So far as I am informed, there are but few companies in Ohio that have not gone into operation under the protection of the city ordinances granting *exclusive* privileges for a short term. That is all taken away by this decision, and all are now at the mercy, not only of the consumer, but small gas works are at the mercy of any unscrupulous clique, who choose by clamoring and bogus offers to the City Council, to get the price fixed so low, as to break down the company, or individual who own the works, then they step in and purchase for a song.

The position of gas companies in Ohio to-day is a grievous one. Our capital is invested and cannot be removed. The legislature say, we give you over to the mercy of your customers; they shall dictate what streets you shall light, and insist on your so inveating (although you may not be making a dollar); they also shall fix the price they choose to pay you for the merchandise you supply them; in other words, the city shall run your business for *their* benefit at *your* expense, and if you refuse to comply, why you can stop operating and lose half your capital by selling out, for your power to resume is gone by your suspension of business.

If there is any other business over which they assume such absolute control, or any other State that has statutes that make a contract so utterly naked and worthless, *after* having been entered into, and in good faith complied with for so many years, then I should like to be referred to it. You, Messrs. Editors, are perhaps better informed than myself on this matter, and can point to such law or State; for myself it seems to me so utterly void of justice, that I have not patience to pursue the matter further, until some of our Ohio men indicate a desire to aid in odtaining a modification of those laws.

I am, Messrs. Editors,
Yours ever,
MACHINIST.

Gas from a Dog's Carcass.

NEW YORK, June 8, 1870.

Messrs. Editors: In your edition of the 2d ultimo, under the heading "CHEMICAL REPERTORY," you say that "All Flesh is Gas." This brings to my mind a circumstanec that occurred at a Works I remained in charge of some two years after completion, in 1857.

One of the workmen while defending himself from the attack of a large dog, struck him with a piece of tubing and killed him. As the animal was highly prized by its owner trouble was anticipated, and the question arose as to what would be the best way to dispose of the carcass, when it was decided to put it in a retort and *make gas of it*. It was put into one that had been in use for some time, and contained considerable carbon; the result was that when the charge *or dog* was drawn, nearly all the carbon came with it, leaving the retort nearly as clean as when put in new. The gas at the test burner was much improved. Since that time it is no unusual thing to see the men engaged at these Works dragging a dead cat or dog along with them when going to their work.

Yours respectfully,
J. B. CHICHESTER,
Gas and Hydraulic Engineer.

Recent American Patents.

Pertaining to the Specialties of this Journal, from the 18th to the 26th of June, 1870.

103,828.—Lantern for Streets.—Joseph W. Bartlett. New York city.

103,836.—Pneumatic Gas Machine.—David Boyle, San Francisco, Cal.

103,865.—Shade for Gaslight.—Wm. Fullagar, Brooklyn, N. Y.

103,893.—Pressure-Gauge and Safety Valve.—A. Kent, Lyons, Iowa.

103,902.—Steam Generator.—John Loader and Wm. H. Child (assignors for one third their right to A. W. C. Williams), London, England.

103,917.—Lamp Gas Burner.—Rufus Nutting, Randolph, Vt.

103,929.—Gas Retort.—James Rigby and P. A. Palmer, Marietta, Ohio.

103,972.—Water Wheel.—William Braidwood and H. J. Hewitt, New York city.

103,994.—Apparatus for the Manufacture of Illuminating Gas.—John Dailey, St. Louis, Mo.

104,009.—Vapor Burner.—David R. Fletcher, Covington, Ky.

104,019.—Water-Supplying Apparatus.—John C. Hagan, Nashville, Tenn.

104,026.—Water Wheel.—William Haslup, Sidney, O.

RECENT ENGLISH PATENTS.

[From the LONDON ARTIZAN, June 1, 1870.]

1184.—J. P. Ferris and E. Cradnock—Generating Illuminating Gas.

1207.—A. Browne—Steam Boilers.

1217.—J. Burnley and W. Nichols—Steam Boilers and Furnaces

1240.—V. Babion.—Regulating the Pressure of Gas in Gas Burners.

1245.—O. Murrell.—Generating Steam.

1285.—J. B. Hickmott—Gas.

1286.—W. R. Lake—Steam Engines.

1300.—E. T. Kirkpatrick—Oxygen Gas.

1342.—J. Crouzieres—Gas and Water Tight Joint to Pipes.

1444.—W. E. Gedge—Steam Engines.

1446.—J. A. and J. Hopkinson—Regulating the Supply of Air to Furnaces.

"Dunbar's Gas Retort Setters Guide."

The following subscribers to the above work is acknowledged, making 23:

H. P. Baldy, for Danville Gas Light Company, Danville, Pa.
W. J. Murphy, Little Rock, Ark.

Prof. Henry of the Smithsonian Institute on Lightning Rods.

In answer to a letter of inquiry as to the best method of erecting and constructing lightning-rods, Prof. Henry gives the following instructions:

1. The rod should consist of round iron of about one inch in diameter; its parts, throughout the whole length, should be in perfect metallic continuity, by being secured together by coupling ferrules.

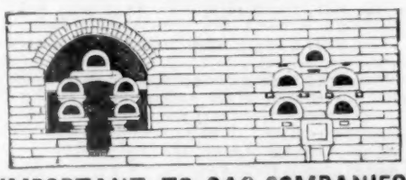
2. To secure it from rust the rod should be coated with black paint, itself a good conductor.

3. It should terminate in a single platinum point.

4. The shorter and more direct the course of the rod to the earth the better; bendings should be rounded, and not formed in acute angles.

5. It should be fastened to the building by iron eyes, and may be insulated from these by cylinders of glass (I don't, however, consider the latter of much importance).

6. The rod should be connected with the earth in the most perfect manner possible, and nothing is better for this purpose than to place it in metallic contact with the gas-pipes, or, better, the water-pipes of the city. This connection may be made by a ribbon of copper or iron soldered to the end of the rod at one of its extremities, and wrapped around the pipe at the other. If a connection of this kind is impracticable, the rod should be continued horizontally to the nearest well, and then turned vertically downward until the end enters the water as deep as its lowest level. The horizontal part of the rod may be buried in a stratum of powdered charcoal and ashes. The rod should be placed, in preference, on the west side of the building. A rod of this kind may be put up by an ordinary blacksmith. The rod in question is in accordance with our latest knowledge of all the facts of electricity. Attempted improvements on it are worthless, and, as a general thing, are proposed by those who are but slightly acquainted with the subject.



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P. H SPELMAN, MASON and BUILDER, No. 282 Third Avenue, corner 22d Street, New York, having made Bench Building and Setting Clay and Iron Retorts a pecialty for nearly twenty years, would respectfully inform those who are about Erecting new or Repairing old Works, that he is prepared to do work in any part of the United States or Canadas, on the most reasonable terms. Address as above. 251–6m

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THE OFFICE FOR THE SALE OF THE GENUINE **Sabbaton's Patent Coke Screening Shovels** is now at 96 MAIDEN LANE, where all orders will be promptly filled.

Recent improvements have made them indispensible to Gas Companies.

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J. H. ROBINSON & CO.,

ENAMELLERS, DIAL AND TABLET MANUFACTURERS,

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Manufacturers of all descriptions of Gas, Water, and Station Meter, Clock, Timepiece, Tell-Tale and Long Dials.

Lettered Addresses, Number Plates, Imperishable Gauges, Scales, etc. Superior articles at reasonable prices. Number Plates on Copper 5s. per dozen. 252

TO PATENTEES AND MANUFACTURERS.

SUCH REQUIRING A FIRM TO INTRODUCE their Goods by means of Special Agents in Europe, will please quote lowest prices, and full particulars, to JOHN BAILEY, & CO. Engineers, Sundrymen and Brass Founders, Albion Works, Salford, Lancashire, England.

REFERENCE.—The Manchester Branch of the Liverpool and Manchester District Bank.

Good well tested novelties will receive attention.

Orders executed for all sorts of English Mechanical Goods, if accompanied with cash or a credit in England.

Five per cent. charged on amounts below £100.

Established thirty years. 247-tf

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NOW BEING EXTENSIVELY MANUFACTURED in England by J. BAILEY & CO., Albion Works, Salford, Lancashire. The profits on the manufacture are *very* satisfactory. Apply to the Proprietors, or to

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SITUATION WANTED.—A GAS ENGINEER of nearly twenty years experience in Building and Managing Works, is now open for an engagement. Undoubted reference furnished as to ability and moral character. Address, ENGINEER, office of thif Journal, or Box 1518, New York P. F.

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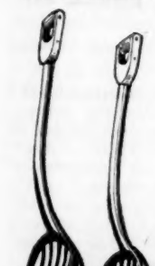
COKE AND COAL
SCREENING SHOVELS.



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Of Every Description.

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PRACTICAL BUILDERS

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Manufacturers of all the latest and most improved

APPARATUS AND TOOLS

FOR THE

Manufacture and Distribution of
COAL GAS.

WORKS AT THE RAILWAY DEPOTS,
FORT WAYNE, INDIANA.

We manufacture Bench Castings, Washers, "The Immersed Multitubular," and Atmospheric Condensers, Wet and Dry-Lime Purifiers, Dry Center Seals, Telescopic and Single Gas Holders Wrought Iron Trussed Roof for Iron or Slate, Wood and Iron Trays for Purifiers, Coke and Coal Carts, Wrought Iron Screening Shovels, and Castings and Wrought Work of every description for Gas-works.

As Mr. Murray is a Practical Draughtsman, we will furnish plans and specification to parties or Associations, or will wait personally upon parties contemplating the construction of new works, or the alteration or extension of old ones.

The most satisfactory references can be given, if required, of the experience and commercial fairness which characterizes our dealings.

We would respectfully invite Western men to call and see our patterns and works here. MURRAY, & BAKER,
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PICTOU, SYDNEY LINGAN, NEWCASTLE, CANNEL AND WELSH COALS.

Agent for the New England States, for the sale of the

Delaware, Lackawana, and Western Railroad Company's Scranton Coal.
Cumberland Coal and Iron Company's George's Creek Cumberland Coal.
Penn Gas-Coal Company's Superior Gas Coal.
Also, Agent for the { Gowrie Mines, Cow Bay, / International Co.'s Union Mines, / Bridgeport, } Nova Scotia. / Acadia Coal Company, of Pictou. / Little Glace Bay Mining Co.

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C. B. SWAIN,
No. 137 Front Street, New York.
225-1y

THE NEWBURGH
ORREL COAL COMPANY,

Mines at Newburgh, Preston County, West Va.
Company's Office, No. 52 S. Gay street, Baltimore, Md.
C. OLIVER O'DONNELL Pres't. G. W. MAHOOL, sec'y.
CHAS. W. HAYS, Agent in New York, Room 7, Trinity Building, 111 broadway.
W. D. CRANE & Co., 26 Kilby street, Boston.

This Company offer their very superior Gas Coal at lowest market prices.

It yields 10,936 cubic feet of gas to the ton of 2,240 lbs., of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York; the Brooklyn and Citizens' Gas Light Companies of Brooklyn, N. Y.; the Baltimore Gas Light Company of Baltimore, Md., and Providence Gas Light Company, Providence, R. I.

The best dry coals shipped, and the promptest attention given to orders. 224-1y

THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

To Gas Light Companies throughout the country.

Agents, PARMELEE BROTHERS, No. 82 Pine street, N. Y.
BANGS & HORTON, No. 31 Duane street, Boston.

Mines in Harrison County, West Virginia.
Wharves, Locust Point, / Company's Office, 29 South street. } Baltimore.

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine.

*** Reference to them is requested. 204-1y

West Fairmount Gas Coal Mines.

HENRY Y. ATTRILL, Proprietor.

Mines at Fairmount, Marion Co., West Va.

Oliver Jackson, Esq., Pres. First National Bank of Fairmount, Manager.

Wharves, Hankey's Locust Point, / Office, 35 S Gay-street, } Baltimore, Md.

I offer this superior coal to Gas Companies throughout the United States—SUPERIOR TO ANY. See analysis by Engineer Manhattan Gas Light Company of New York in the "Gas-Light Journal" vol. X, No. 218, p. 217. Orders solicited from Gas Companies, Gas Manufacturers, and shippers of Coal by the cargo

This coal, by analysis of Jos. A. Sabbaton, gave a yield of 9,681 cubic feet, and 9,500 cubic feet to the ton, with an ILLUMINATING POWER OF 19.50 CANDLES, AND 40 BUSHELS COKE. 215-3m

FAIRMONT GAS COAL COMPANY OF NEW YORK.

Mines at Fairmont, Marion County, West Virginia.
Office, 47 Exchange Place, New York.
A. N. MEYLERT, President. HIRAM BENNER, Sec'y and Treas.

THIS COAL IS OF VERY SUPERIOR QUALITY, with an illuminating power of 19 candles, yielding over 10,000 cubic feet of gas to the ton, and an excellent coke.
The orders of Gas Companies solicited. 233-tf.

BRANSON'S PATENT LAMP POST.

THE ADVANTAGES OF THIS PATENT POST over the old style, are as follows:

1st. The saving of the base or bottom part of the Post, when the column is broken, the Post being made in two parts. The broken column can be replaced by a new one, without disturbing the base.

2d. When the old style of post is broken, the bottom piece has to be dug out, which cannot be done in winter, or in wet weather: all this is obviated in this Post, as no digging is required. This style of Post is especially desirable when flag stone sidewalks are used.

3rd. When a stoppage of gas in stand pipe occurs, the column can be lifted out, the pipe detached, cleaned, and replaced in fifteen minutes; no digging being required as is now done with the old Post.

4th. A lighter and better casting can be made from this patent, and it can be handled better, owing to its length and lightness.

5th. In case a broken column cannot be repaired, one third of the original cost is saved by the base being secured and perfect.

Rights for States, or the United States, on reasonable terms. Address, Editors GAS-LIGHT JOURNAL, 42 Pine street, N. Y.

Certificate.

ST. LOUIS, September 1, 1869.

I have examined a new Lamp Post, the Branson patent, and unhesitatingly pronounce it to be the best thing of the kind I have ever seen. Posts of this description have been erected in this city, and in my opinion this style of Post should be universally adopted, as I believe it possesses all the advantages claimed for it.

The St. Louis Gas-Light Company have adapted this Post and ordered a large quantity for immediate use.

THOMAS PRATT,
537-6m Sup. St. Louis Gas Works.

THE FAIRMONT GAS COAL CO. OF NEW YORK.

Office TRINITY BUILDING, No. 111 Broadway, Room 71.

Wharves at Locust Point. Baltimore,

Mines at Fairmont, Marion Co., W. Virginia.

THE FAIRMONT GAS COAL COMPANY OF New York, solicit the orders of Gas Companies for their VERY SUPERIOR GAS COAL.

The Coal from their Mines is remarkably free from sulphur.

For Gas Companies our Coal is carefully screened and shipped, free of slate and other impurities.

This Coal has an illuminating power of 19 candles, yielding over 10,000 cubic feet of gas to the ton, and a large amount of excellent Coke.

Refer to the Manhattan Gas Light Company, New York, and the New York Gas-Light Company, New York.

HIRAM BENNER, A. N. MEYLERT,
246 Sec. and Treasurer. President.

GAS AND KEROSENE FIXTURES

THE TUCKER MANUFACTURING CO.

39 & 41 PARK PLACE, NEW YORK. AND 117 AND 119 COURT STREET, BOSTON.

MANUFACTURERS

Offer the largest variety of New and Handsome Designs of GAS and KEROSENE FIXTURES to be found in any establishment in the country, comprising in both lines an unusual variety of large and massive Fixtures, especially adapted for Churches, Halls, Hotels, Stores, and other Public Buildings, together with a large variety of patterns suitable for dwellings. 245

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Patent Gas Works,

JOHN BUTLER, Sole Manufacturer,

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OIL AND ROSIN GAS WORKS (all sizes) for Towns, Factories, Plantations, Churches, and Private Dwellings. These Works are warranted to make cheaper gas than any small Works known, and are very simple to manage. Refer to *over three hundred now in use from one to thirteen years.*

Estimates furnished for cost of Works, and the cost of manufacturing Gas in various localities.

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AND

Chemical Repertory.

Published on the 2d and 16th of Each Month

At No. 42 Pine Street, New York.

M. L. CALLENDER & CO.,

EDITORS AND PROPRIETORS.

Consulting Chemist,

Geologist and General Scientist,

PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

SATURDAY, JULY 2, 1870.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

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☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same, but they are not authorized to Receipt for Money.*

TO OUR SUBSCRIBERS AND PATRONS.

In making remittances for subscriptions, always procure a draft on New York, or a POST OFFICE MONEY ORDER, if possible. Where neither of these can be procured, send the money, but always in a REGISTERED LETTER. The registration fee has been reduced to fifteen cents, and the registration system has been found by the postal authorities to be virtually an absolute protection against losses by mail. ALL Postmasters are obliged to register letters whenever requested to do so.

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M. L. CALLENDER & CO., Proprietors of the AMERICAN GAS-LIGHT JOURNAL, AND CHEMICAL REPERTORY offer their services to inventors as Solicitors of

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GENERAL EDITORIAL.

A NEW VOLUME.

Our Journal now enters in its thirteenth volume, and if in the past we have given satisfaction to our patrons, we trust in the future we shall place it at the high stand-point we have fixed for it, by making it not only instructive and interesting but valuable for future reference to the student, the scientist, the inventor, the mechanic, the engineer, the chemist, and the general reader, etc.

Our columns will be fully opened to all for information or discussion which may be of value to the public, upon all the subjects specially treated upon in this Journal. We therefore request, and shall esteem it as a favor, if parties possessing valuable knowledge or information relating to the subjects we treat upon, will send it to us either in a crude state for us to prepare; or what would be more grateful to us, to prepare it themselves for publication.

METROPOLITAN GAS CONSUMPTION.

The following are the official returns for the month of May, 1870:

NEW YORK ISLAND COMPANIES.

	Cub. feet.
N. Y. Gas-Light Co.	42,312,593
Manhattan Gas-Light Co.	35,298,614
Metropolitan Gas-Light Co.	24 919,153
Harlem Gas-Light Co.	6,520,450
St. Nicholas Gas House	183,800
Total cubic feet	159,234,610

LONG ISLAND COMPANIES.

Brooklyn Gas-Light Company	55,630,900
Williamsburgh Gas-Light Co.	7,523,723
Flatbush Gas-Light Co.	288,972
Union Gas-Light Co.	171,900

From hence we can give an interesting comparison of the make of our four great City Gas Companies, exhibiting their respective rates of falling off, from April to May, as the days lengthen.

Companies.	April; Thousands.	May; Thousands.	Falling off, Per Cent.
Manhattan	103,540	85,299	17.62
New York	45,760	42,313	7.53
Metropolitan	27,760	24,919	10.23
Harlem	8,575	6,520	23.96
Totals	185,635	159,051	14.85

We shall say little just at the present time, in comment upon the many suggestive points presented by this little Tabulation; but shall pursue the subject further at a future day. In reference to the decrease of the New York Co., which it will be observed is but half the average, it must be pointed out that in their *down town* district, chiefly the "business" section of the city, so much gas is burned *during daylight* as to go largely to explain this.

In the case of the HARLEM Co, also, whose ratio of diminution is so much higher than that of the others, a good and obvious reason exists, in the comparative absence from their district of large hotels, restaurants and factories, which burn much gas far into the night. H. W.

FARMER'S THEOREM.

In the last number received (June 7, 1870,) of the *London Journal of Gaslighting*, we find the following:

"In the *American Gaslight Journal* for April 2, Mr. Farmer criticizes the letter of Mr. Hunt which appeared in the JOURNAL OF GASLIGHTING for March 1. The criticisms do not amount to very much; but an attempt is made to show that Mr. Hunt was too anxious to disprove the theorem. Mr. Farmer's conclusion is that the application of his theorem in the experiments proves that the proper consumption for the burners and gases employed by Mr. Hunt is 4.50 cubic feet, and the farther we get up or down from this quantity the greater will be the error in the results. He adds that every gas and every degree of consumption will require a suitable burner if a perfect combustion and luminous development is required, an opinion which may stimulate gas engineers in their search for other than photometrical means of determining the quality of the gas.

We may add that some additional experiments, published by Mr. Farmer, go to show that the illuminating power of a rich gas is greatly underestimated, when the calculation from smaller consumptions to the normal standard of five feet is made by the simple rule of three."

Next to this we find also a second article from Mr. CHARLES HUNT F. C S., on Photometry. Mr. HUNT'S first article has already been given by us (CHEMICAL REPERTORY; No. 27; April 2d, 1870). We can give here but a short extract from Mr. HUNT'S present article, which is long, and contains many Tables. He says:

"As a starting-point in the consideration of this question, it seems desirable to know what amount of uniformity there is in the illuminating value at different rates of consumption with different burners. On the one hand, a uniformity of results would serve as a guide to the ratio of increase; on the other hand, an absence of uniformity would infer certain conditions in the burner affecting such ratio, and until these conditions are satisfied or removed, no definite conclusion can be arrived at.

"Taking this view of the matter, I first subjected three Argands, being those most in use at the present time, to a series of trials with gas of as nearly as possible the same quality. The third column in the following table is calculated downwards, from the highest proportionate value in each case:—

No. 1.—Sugg's "London," 6-inch Chimney. Initial Pressure — 9-10ths; Standard of Comparison, a "London" Burner, consuming 4·906 Cubic Feet per Hour — 14·93 Candles.

Consumption per Hour. Cubic Feet.	Illuminating Value in Sperm Candles.	Illuminating Value calculated by Rule of Three.	Difference per cent. between Real and Calculated Value.
5·964	19·39		
5·526	17·14	17·96	4·78
5·208	15·91	16·93	6·41
4·992	14·94	16·23	8·63
4·576	13·36	14·87	11·30
3·996	8 98	12·97	44·43
3 528	6 12	11·47	87·41
3·030	3 28	9·85	200·30
2·472	1·37	8·03	486·13
2·004	0·47	6·51	1285·10

Mr. FARMER has, at our request, subjected Mr. HUNT'S figures to examination, and, although not yet fully ready with his critical remarks, is enabled to state that Mr. HUNT'S measurements, when submitted to the test of the new theorem of squares, diverge far less for the smaller consumptions; and that when tabulated according to his own idea of the way they should be, he gets for the larger consumptions errors about equal to those of Mr. HUNT'S calculations, but in the opposite direction.—H. W.

THE CHEMICAL HISTORY OF A CANDLE.

Having received numerous communications from our subscribers requesting us to republish the series of Lectures by Prof. Faraday on "The Chemical History of a Candle," which appeared in this Jonrnal in 1861, we readily comply, and have commenced the same in this number, to be illustrated with new engravings. The subjects of combustion and illumination are always interesting, and cannot be too familiar, not only to the student, the scientific reader, and practical gas manufacturer, but to the people at large, who depend so greatly upon artificial light, as a necessity, a convenience, and a luxury.

We feel sanguine, therefore, that the majority of our readers will be interested in the perusal of these lectures, which are expressed in the graphic language of one of the most popular scientific lecturers of this or any age.

ADVERTISING.

There are few people who understand the law of advertising. The few who do understand it invariably succeed and amass fortunes. There is not a single exception to this rule. The law of advertising, clearly understood and obeyed, enables the advertiser to realize the abounding truth there is in one of the proverbs of Solomon: "There is that scattereth and yet increaseth." And he who misunderstands the law of advertising, or fails to give obedience to it, will surely realize the other half of the same proverb: "There is that withholdeth more than is meet, but it tendeth to poverty." Advertising, to be successful, should not be spasmodic and intermittent, but continuous. Perservered in, it always yields reward. There is no such word as fail to the persistent advertiser. And he who expects results from a single advertisement, which has had but two or three insertions and is then withdrawn, is no more reasonable than a man would be to expect favorable results from taking his shutters down three days in a month, and keeping the shutters closed the remainder of the time; or than the man who shrouds his signs of business except on particular days and long intervals of time.

A REMARKABLE GAS-BURNER

In another column appears an advertisement of a flat-flame burner, in which is involved a new principle, discovered by Mr. JOSEPH W. CREMIN, of this city, and patented by him Jan. 11, 1870. This burner is already, we are informed, coming into rapid use; and our own observation certainly appears to justify such use unmistakably. At the request of Mr. CREMIN, the undersigned has made some practical tests, and is enabled to report the following facts:

That on the evening of June 13th, 1870, in the Photometric room of the METROPOLITAN GAS-LIGHT Co., at their 42nd street Station, in company with Mr. DIETRICH, the Engineer of said company, he made comparative tests of burners of Mr. CREMIN's pattern, in comparison with an ordinary three-feet fish-tail.

The general result was that, the pressure being one inch, and the consumption 3½ cubic feet of gas per hour, the ordinary burner indicated an illuminating power equal to seven candles, while the "Champion Gas Burner" of Mr. CREMIN went up as high as 11.5 candles; thus indicating, according to this experiment, a clear gain, by the employment of his peculiar principle, of over *sixty-four* per cent. of light from the same materials.—HENRY WURTZ.

POTTER'S ADJUSTABLE COUPLING.

Gas Companies, particularly, will appreciate the utility and convenience of this coupling, which is fully illustrated and described in this number of the Journal. So also will it commend itself to gas-fitters and plumbers, and all who have occasion to make connection of gas or water piping. It is more especially adapted to small connections, such as meters and service pipe connections, where it seems to be just the thing needed. This is one of those simple but essential improvements, which is destined to become very popular and, we trust, profitable to the inventor.

BAILEY'S PATENT PYROMETER.

An illustration and description of Bailey's Patent Pyrometer, will be found in another page of this number of the Journal.

This is an English invention of much merit, an doubtless, will interest not only the scientific reader but will be especially acceptable to those who can employ it practically, such as bakers, engineers, chemists, matallurgists, etc.

Superintendents of Gas Works and gas engineers, will find this little instrument to be of wonderful utility as a constant and unerring indicator of the temperature of their benches, and after once using it, they will wonder how they ever got along without it.

The economy of gas making, it is well known, depends in a large degree upon the uniformity of the temperature of the retorts.

The common practice of *guessing* at the temperature by looking into the retorts or benches, and observing the *color*, is not only fallacious but a most troublesome nuisance; but with this instrument any one by a glance at the dial or index can see the exact degree of temperature within and regulate it accordingly.

BALTIMORE RETORT AND FIRE BRICK WORKS.

The extensive clay retort and fire brick establishment of George C. Hicks & Co., is situated at Locust Point, in the city of Baltimore, having a fine water front among the piers used for shipping the West Virginia Gas Coals, so that their goods are loaded aboard the various vessels for direct shipment to any port. The railroad is also at their door, so that they receive coal direct from the mines at first cost, and they themselves load their goods for the West or South aboard the freight cars.

They have extensive beds of the most valuable fire clays very near their works, ensuring standard supplies for many years. Their experts manufactured the first clay retorts made in this country, at the establishment of the late J. K. Brick & Co., Brooklyn, and made the reputation of that firm. Among the many gas works using their retorts are the Baltimore, Philadelphia, Brooklyn and Wilmington with exhausters, and Alexandria, Annapolis, Tarrytown, and Pottstown without exhausters, to any of whom reference may be made. A remarkable feature of their retorts is the very slow rate at which they gather carbon, their average running being over six months, without cleaning. Their clays are of extraordinary refractability, being both of the hard and plastic kinds; and they claim that their *double X* fire brick are the best ever offered to consumers.

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It is only necessary to mention the name of the firm who have had the enterprise and energy to compile this work, to understand that it is a success. It gives the biographies of those advertisers best known, and longest established in our country, with sketches of their lives, and hints of the secrets that led to their success. Any business man can read it with both interest and profit.

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The work is artistically gotten up—good paper, clear type. Octavo size; about 900 pages. Price, $5.00.

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We can also sell three Iron Retorts (new) and one setting of New York Tile, at less than cost; or will exchange the whole for three, four and six-inch pipe.

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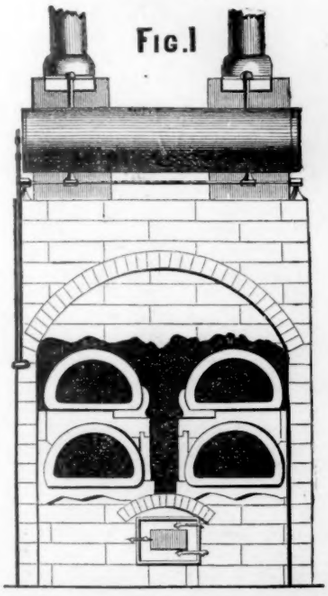
Curley's Improved Retort Setting.



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PREVENT THE *SUDDEN* COOLING OF AND *Destruction* of *Retorts*, and *facilitates clinkering*, and *increases the yield of gas.*

CURLEY'S PATENT SHIELD TILE prevents the rapid *burning out* and *destruction of Retorts*, and *doubles the life of the Retorts.*

Gas Companies who desire larger dividends can be gratified by adopting "CURLEY'S IMPROVED RETORT SETTING." Send for descriptive circular.

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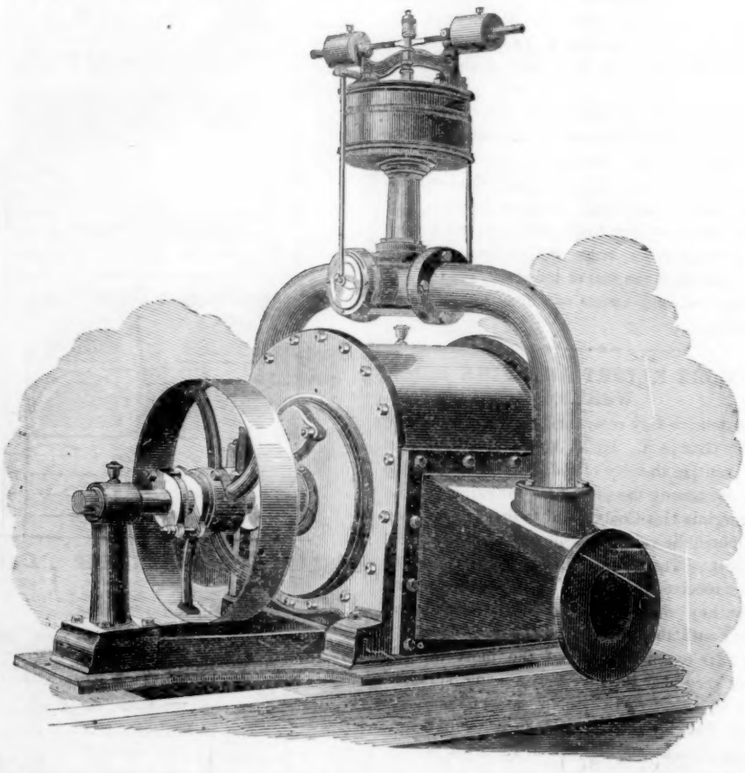
AND PATENT COMPENSATOR.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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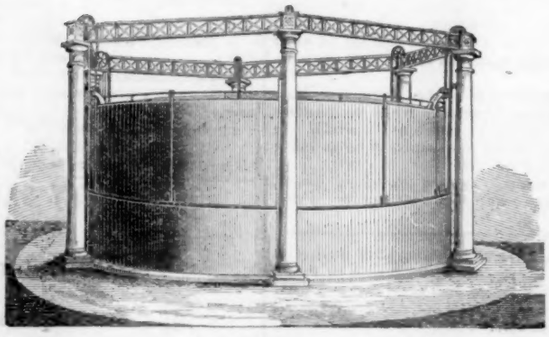

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FIG. 1.

Fig. 1 shows a single gate valve.

Fig. 2 represents wedge and one-half of gate of double valve, intended for larger sizes, when required to bear heavy pressure either side.

Fig. 3, represents a section through body, gate and wedge.

The slides, G G, are held against wedge D, by ribs, H H, projecting from sides of valve body, A.

In closing the valves, when opening I is covered, slides, G G, pass the lower ends of ribs, H H, when the wedge, D, can move forward on the inclined planes E E, and crowd the gates apart.

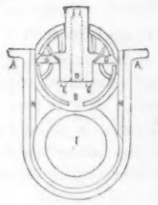

FIG. 3.

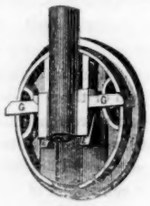

FIG. 2.

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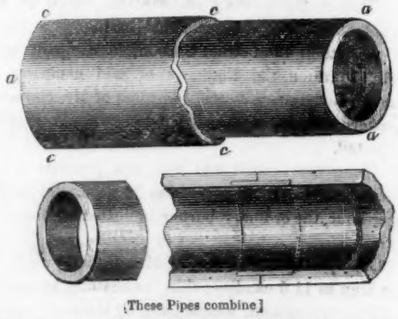

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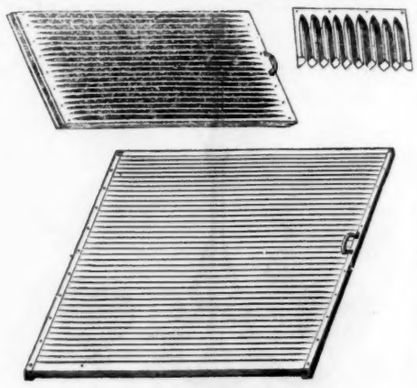

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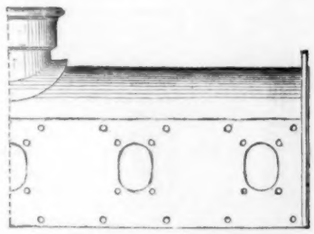

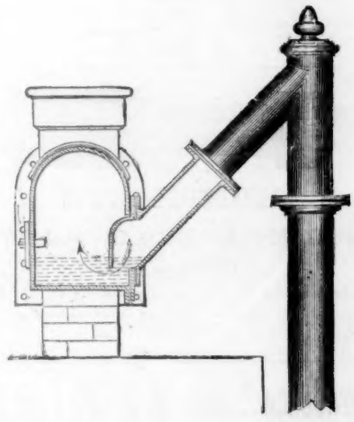

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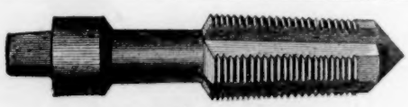

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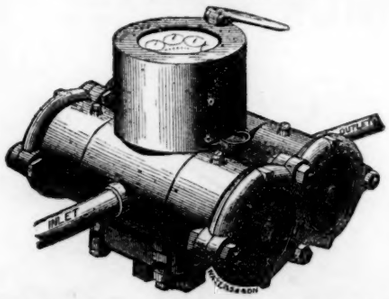

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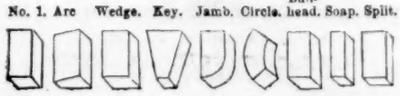

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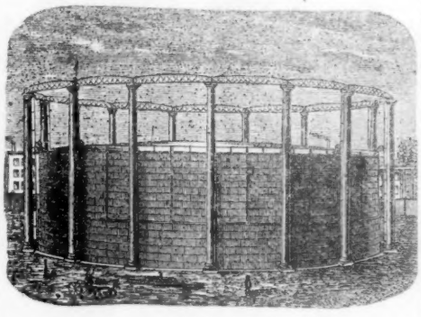

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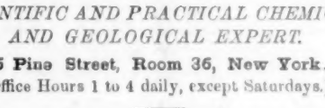

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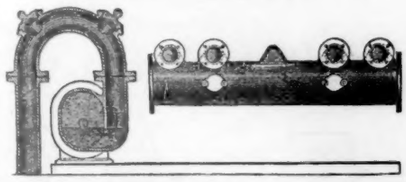

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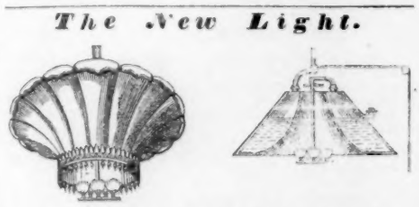

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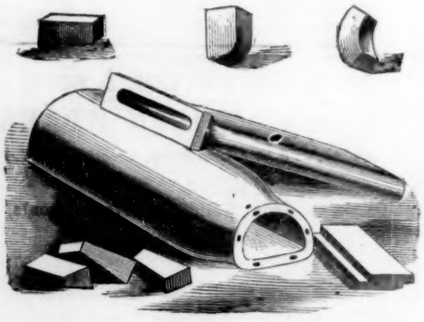

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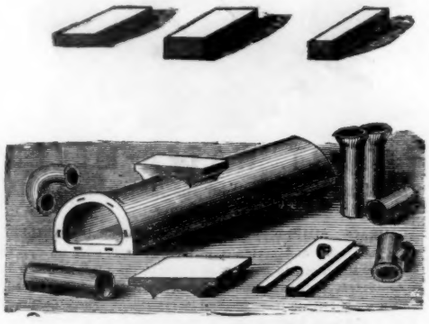

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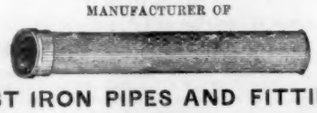

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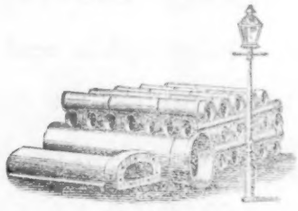

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Fairmont Gas Coal Co.—Office, 47 Exchange Place, N. Y 8
Gas Retorts, Etc.—George C. Hicks & Co., Baltimore, Md. 9
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Gas-Burners—C. Gefrorer, 529 Commerce street, Philadelphia, Pa. 9
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street,
Gas Producing Materials—John K. Truax & Co., Pittsburgh, Pa. 3
Philadelphia, Pa. 8
Gas Apparatus, &c.—Geo. H. Kitchen & Co., 561 Broadway. . . 9
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Gasometers, Etc—George Stacey & Co. Cincinnati, O. 6
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway. 4
Gasholders, Etc.—Deily & Fowler, 39 Laurel street, Philadelphia 6
Gas and Water Pipes—R. D. Wood & Co., Phil. 2
Gas and Water Pipes—B. S. Benson & Son, Allentown, Pa. 7
Gasometers, &c.—Keystone Iron Works—2132 Filbert st., Phil. 4
Gas and Kerosene Fixtures—Tucker Manufacturing Company, 39 and 41 Park Place, N. Y., and 119 Court street, Boston. . . . 2
Jersey City Gas Meter Works. 14 Morris st., Jersey, N. J. 5
Ludlow Valve Mf'g Co., 193 River street, Troy, N. Y 4
Lava Gas Tips, etc., etc.—James J. Walworth & Co., 2 Bath st., Boston, Mass. 9
Oil and Rosin Gas Works—John Butler, 126 Maiden Lane, New York. 2
Patent Conically Slotted Wood Trays—John L. Cheesman, 147 and 149 Ave. C., N. Y 5
Patent Gas Exhauster—Smith & Sayre, 95 Liberty st. 4
West Fairmount Gas Coal Mines, Office, Baltimore Md. 9
Wooden Gas and Water Pipe—Wyckoff Bros. & Co., Elmira. . . . 4

GAS COALS,

Gas Coals—Bird, Perkins & Job, 86 South street, New York. . . . 9
Gas Coals—F. H. Odiorne, 146 Broad st., Boston, or C. B. Swain, 137 Front street, N. Y. 2
The Newburgh Orrel Coal Company—Chas. W. Hays, Agent in New York, Trinity Building, 111 B'way, Room 7. 2

FOUNDRIES.

Brooklyn Tube Works—B. T. Benton, Brooklyn. 8
Columbian Iron Works—Wm. Taylor & Sons, 11, 13 and 15 Adams street, Brooklyn, N. Y. 7
Cast Iron Pipes and Fittings—B. S. Benson, 52 East Monument street, Baltimore, Md. 8
Continental Works—T. F. Rowland, Greenpoint. 7
Camden Iron Works, Camden, N. J.—Jesse W. Starr & Sons. . . 7
Gloucester Iron Works, Camden, N. J. 7
Louisville Pipe Works—Dennis Long, Cor. 9th and Water-sts., Louisville, Ky. 8
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman and Wilkins streets, Pittsburgh, Pa. 7
Oregon Iron Foundry—Herring & Floyd, 738, 740, 742 and 744 Greenwich street, New York. 9
Pascal Iron Works—Morris, Tasker & Co., Philadelphia, Pa. . . 9
Retorts, Pipes, &c.—R. D. Wood & Co., 400 Chestnut street, Philadelphia. 8
Southwark Foundry—Merrick & Sons, Fifth and Washington streets, Philadelphia. 9

WATER METERS, PUMPS, ETC.

Ashcroft's Low-water Detector, 50 John street, New York. 7
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Cast Iron Pipes for Water and Gas—Riley A. Brick, 89 White street, N. Y. 2
Steam Pumps—H. R. Worthington, 61 Beekman st. New York. . 8
Valves for Water, Steam and Gas—Ludlow Valve Man'g Co., 193 River street, Troy, N. Y. 4
Water Pipes, etc.—S. Fulton & Co. 412 Walnut street, Phila. . . . 1
Water Closets, etc.—William S. Carr & Co. 106, 108, and 115 Centre street, New York. 8
Worthington's Water Meters—H. R. Worthington, 61 Beekman street, New York. 7

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B. Kreisher, Clay Retorts, Etc., 58 Goerck street, New York. . . . 5
Brooklyn Clay Retort Works, Van Dyke st. Brooklyn, N. Y. . . . 5
Jersey City Fire Brick Works.—J. H. Gautier & Co., Greene, Essex and Bergen streets, Morris Canal Basin, N. J. 5
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Manhattan Clay Retort Works, 15th st. near Av. C, New York. . . 5
Philadelphia Fire Brick Works, Vine and 23d sts. Philadelphia. . 5
Clay Retorts, Fire Brick, Tiles, etc.—Wilson & Gardner, Lockport, Westmorland County, Pa. 5
Retort Setting, Curley's "Independent Damper"—Thomas Curley, Wilmington, Del., or C. E. Sanderson, 42 Pine street N. Y., Room 18. 3

MINING MACHINERY, ETC.

Mining Engineer—J. H. Tiemann, 240 Pearl st. New York. 8
School of Mines, Columbia College, East 49th st. 7

LAMPS, STOVES, PETROLEUM, ETC.

Branson's Patent Lamp Post—Editors Gas-Light Journal, No. 42 Pine street, N. Y. 2
Lamps, &c.,—Julius Ives & Co., 49 Maiden Lane, N. Y. 6
Street and Depot Lamp—Heath & Smith Manufacturing Co., 44 Murray street, N. York and 52 Randolph st., Chicago, Ill. . . . 2

MISCELLANEOUS.

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Humphrey's Condensed Drill, Reamer and Tap. 2
Despard Coal, 32 Pine street, N. Y. 2
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Professor Henry Wurtz—Office Gas-Light Journal. 2
Pianos—Raven & Bacon, 644 and 646 Broadway, N. Y. 9
Screening Shovels—O. R. Butler, 126 Mhiden Lane, N. Y. 2
Works Upon Gas—D. Van Nostrand, 23 Murray street and 27 Warren street, N. Y. 5

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